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EAST EUROPE

USSR AND EASTERN EUROPE SCIENTIFIC ABSTRACTS

ENGINEERING AND EQUIPMENT

(FOUO 2/79)

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Fluid Mechanics

USSR UDC 536.40

INVESTIGATING MECHANISMS OF VIBRATIONAL PROPAGATION OF A FLAME VIA ITS AMPLITUDE-PHASE CHARACTERISTICS

Cheboksary FIZIKA GORENIYA I METODY YEYE ISSLEDOVANIYA [Physics of Combustion and Research Methods] in Russian No 1, 1978 pp 6-11

AVVAKUMOV, A. M. and CHUCHKALOV, I. A.

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 1, 1979 Abstract No 1.34.14]

[Text] Results of a study of the mechanism vibrational flame propagation in tubes are cited. Based on an evaluation of the energy contribution of possible mechanisms of excitation of vibrations, it was shown that in narrow tubes, oscillations are maintained by means of periodic changes in the area of the flame in the sonic boundary layer. In wide tubes a mechanism may be realized that is based on a change in chemical reaction rate due to a change in thermodynamic properties of the gas. Figures 3; references 6.

USSR UDC 541.124

STUDY OF THE EFFECT OF ADDITIVES OF CATION-SUBSTITUTED SORBENTS ON THE KINETICS OF THERMAL DECOMPOSITION AND COMBUSTION OF A MODEL MIXTURE BASED ON AMMONIUM PERCHLORATE

Cheboksary FIZIKA GORENIYA I METODY YEYE ISSLEDOVANIYA [Physics of Combustion and Research Methods] in Russian No 1, 1978 pp 15-19

YEGOROV, M. YE., ORLOV, V. N. and NIKIFOROV, N. F.

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 1, 1979 Abstract No 1.34.139]

[Text] Experimental data are cited on the effect that additives of cation-substituted sorbents have on the kinetics of thermal decomposition and the rate of combustion of a model mixture based on ammonium perchlorate. Additives of cation-substituted sorbents displace the temperature interval of the high temperature stage of decomposition of ammonium perchlorate toward lower temperatures and increase the rate of combustion. Figures 6; references 3.

USSR UDC 536.46

ROLE OF HYDRODYNAMIC FACTORS IN FLAME PROPAGATION

Cheboksary FIZIKA GORENIYA I METODY YEYE ISSLEDOVANIYA [Physics of Combustion and Research Methods] in Russian No 1, 1978 pp 31-33

ALEKSEYEV, M. V.

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 1, 1979 Abstract No 1.34.138]

[Text] Experimental results are cited of a study of the process of flame propagation over a surface of mixtures based on ammonium perchlorate with a counterflow of air. Participation of combustion products in vortex motion ahead of the propagating flame plays a basic role in transmitting heat from the flame to the source substance. Figures 3; references 6.

USSR UDC 662.311.4+662.58

ON IGNITION OF CONDENSED SUBSTANCES IN THE FLOW OF A HEATED GASEOUS OXIDANT

Cheboksary FIZIKA GORENIYA I METODY YEYE ISSLEDOVANIYA [Physics of Combustion and Research Methods] in Russian No 1, 1978 pp 51-56

ISAKOV, G. N.

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 1, 1979 Abstract No 1.34.143]

[Text] An approximate theory of ignition of low-volatility condensed substances in a flow of heated gaseous oxidant is proposed. It is assumed in addition to homogeneous chemical reaction in the solid phase that a heterogeneous reaction can occur on the surface of the substance. Approximate analytical expressions are obtained for the basic characteristics of ignition and the results are qualitatively analyzed. In one limiting case, condensed substances can be ignited as an inert polymer material. The physical condition for ignition of condensed substances in a flow of heated gaseous oxidant is formulated. Figure 1; references 9.

USSR UDC 536.46-541.12.034

ON THE EFFECT OF ELECTRICAL FIELD ON STABILIZATION OF A FLAME IN A GAS BURNER WITH POSITIVE POLARITY

Cheboksary FIZIKA GORENIYA I METODY YEYE ISSLEDOVANIYA [Physics of Combustion and Research Methods] in Russian No 1, 1978 pp 56-61

ISAYEV, N. A. and KSENOFONTOV, S. I.

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 1, 1979 Abstract No 1.34.15]

[Text] Experimental results are cited for stabilization of a flame in a longitudinal electrical field with positive gas burner polarity for various flames. An increase in velocity of blow-out was due to the action of an ionic wind of negative ions contained in the combustion zone. Figures 6; table 1; references 3.

USSR UDC 662.17:541.182.3

COMBUSTION OF MODEL MIXTURES OF ORANGE SMOKE BASED ON AMMONIUM PERCHLORATE

Cheboksary FIZIKA GORENIYA I METODY YEYE ISSLEDOVANIYA [Physics of Combustion and Research Methods] in Russian No 1, 1978 pp 62-64

ARSH, M. M., MADYAKIN, F. P., BASOVA, I. S., BATUROVA, G. S., PROSTATOVA, L. I. and DENISOV, F. T.

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 1, 1979 Abstract No 1.34.141]

[Text] Experiments established that effectiveness of model mixtures of orange smoke based on ammonium perchlorate may be enhanced by using imidazole as a flame quencher. Results are cited of a thermographic study of model mixtures, as well as mixtures of ammonium perchlorate with different flame quenchers. The possible use of catalysts to dissociate ammonium perchlorate in orange smoke mixtures is considered. Granulation of the dye increases color saturation of smoke at low rates of combustion. Tables 3.

USSR UDC 536.46

EFFECT OF ATMOSPHERIC CHEMICAL COMPOSITION ON COMBUSTION PATTERNS OF NITROCELLULOSE AT REDUCED PRESSURES

Cheboksary FIZIKA GORENIYA I METODY YEYE ISSLEDOVANIYA [Physics of Combustion and Research Methods] in Russian No 1, 1978 pp 65-70

ISAYEV, N. A., DANILOV, N. S., KSENOFONTOV, S. I., KACHUSHKIN, V. I. and GALKOVA, N. YU.

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI, No 1, 1979 Abstract No 1.34.142]

[Text] Results are cited of a study of combustion of nitrocellulose in various gaseous media at reduced pressures. With an increase in the concentration of oxygen, the rate of surface propagation of the flame increases by one order. Figures 5; references 3.

USSR UDC 536.46

ON THE EFFECT OF GAS FLOW TEMPERATURE ON THE RATE OF FLAME PROPAGATION

Cheboksary FIZIKA GORENIYA I METODY YEYE ISSLEDOVANIYA [Physics of Combustion and Research Methods] in Russian No 1, 1978 pp 73-78

ALEKSEYEV, M. V.

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 1, 1979 Abstract No 1.34.140]

[Text] Results are cited of an experimental study of the influence that temperature and flow rate have on the propagation rate of a flame over the surface of model mixtures and a physical explanation is given for the patterns that are found. Figures 6; references 3.

USSR UDC 536.46

EFFECT OF ELECTRICAL DISCHARGE ON PROPERTIES OF A FLAME CONTAINING CARBON PARTICLES

Cheboksary FIZIKA GORENIYA I METODY YEYE ISSLEDOVANIYA [Physics of Combustion and Research Methods] in Russian No 1, 1978 pp 142-143

ZAYTSEV, A. S., TVERDOKHLEBOV, V. I. and TVERDOKHLEBOV, L. S.

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 1, 1979 Abstract No 1.34.16]

[Text] The energy distribution function was found for plasma electrons in a luminous oxyacetyline flame intensified by glow discharge. Discharge current was $I = 15 \times 10^{-3}$ A, pressure in the low-pressure chamber was $p = 5$ mm Hg, concentration of acetylene in the combustible mixture was 56%. Glow discharge occurring in the reaction zone increases electron concentration there, without changing it in the zone containing carbon particles. Figures 1; references 2.

USSR UDC 621.224-225.12:532.5

SECONDARY VORTICAL FLOW IN THE SPIRAL CHAMBER OF A MODEL RO-310 RADIAL-AXIAL WATER TURBINE

Khar'kov GIDRAVLICHESKIYE MASHINY. RESPUBLIKANSKIY MEZHVEDOMSTVENNYY NAUCHNO-TEKHNICHESKIY SBORNIK [Hydraulic Machines. Republic Interdepartmental Scientific and Technical Collection] in Russian No 12, 1978 pp 26-28

LASENKO, V. YE., BULGAKOV, V. A. and DRANKOVSKIY, V. E.

[From REFERATIVNYY ZHURNAL, TURBOSTROYENIYE No 10, Oct 78 Abstract No 10.49.227]

[Text] Results of an experimental study are presented demonstrating how the development of secondary flow in the volute chamber of a slow water turbine is affected by the cross section of that chamber. Ways to improve the shape of the volute inlet of such a water turbine are indicated. Figures 2; references 3.

USSR UDC 621.438.669.183.213

EFFECT OF THE MERIDIONAL CLEARANCE BETWEEN HOUSING AND RUNNER BLADES ON THE EFFICIENCY OF RADIAL-AXIAL AND DIAGONAL-FLOW TURBINES

Minsk IZVESTIYA VUZOV ENERGETIKA in Russian No 7, 1978 pp 61-65

SHERSTYUK, A. N. and CHIZHOV, V. V.

[From REFERATIVNYY ZHURNAL, TURBOSTROYENIYE OTDEL'NYY VYPUSK, No 10, Oct 78 Abstract No 10.49.224]

[Text] A model is proposed to describe the flow in the meridional clearance between housing and runner blades. A method of calculating the losses in this clearance has been developed, on the basis of this model, which yields not only the dependence of those losses on the clearance width but also their distribution over the meridional perimeter. A close agreement is found between experimental and theoretical data pertaining to the effect of clearance on the turbine efficiency. Figures 4; references 7.

USSR UDC 629.7.030.3:533.697.2

HEAT FLUXES IN A HYPERSONIC AIR INTAKE WITH TURBULIZER AND BLUNT CENTRAL BODY

Ramenskoye ULHENYYE ZAPISKI TSENTRAL'NOGO AERO-GIDRODINAMICHESKOGO INSTITUTA [Scientific Annals of Central Aero-hydrodynamics Institute] in Russian 9, No 4, 1978 pp 24-34

GURYLEV, V. G. and SHKIRIN, N. N.

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 1, 1979 Abstract No 1.34.41]

[Text] The effect of turbulizers and blunted nose portions of a profiled cone on the pattern of flow around cooled and non-cooled models of hypersonic air intakes and on the heat flux to the central body at Mach 7 in the range of Reynolds numbers $(0.4\text{-}2.2) \times 10^5$ was studied. In the range Mach 5-10 (chi = 1.4), results are presented for calculation of total heat fluxes on braking surfaces ahead of the intake and in the throat region of axisymmetric and plane external compression air intakes. Results of calculation were compared with experiment. Figures 6; references 8.

High-Energy Devices, Optics and Photography

USSR UDC 621.375.826

CALCULATION OF THE CHARACTERISTICS OF A MIXING GAS-DYNAMIC LASER

Minsk NEKOTORYYE PROBLEMY TEPLO- I MASSOOBMENA [Some Problems in Heat and Mass Transfer] in Russian 1978 pp 56-59

ACHASOV, O. V. and FOMIN, N. A.

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 12, Dec 78 Abstract No 12.34.157]

[Text] None

Industrial Technology

USSR

UDC 621.438-233-2(088.825)

HIGH-SPEED BALL-BEARING

Author's Certificate, USSR, class F 16 C 33/38, No 550500, filed 28 Mar 75, No 2116544, published 13 Apr 77

MOROZOV, G. V., IVANNIKOV, V. G., DOMASHEV, O. M., BARANOV, V. G. and KEKUKH, V. S.

[From REFERATIVNYY ZHURNAL, TURBOSTROYENIYE No 1, 1979 Abstract No 1.49.133 P]

[Text] A high-speed ball-bearing is proposed, containing outer and inner races, balls, and a separator in the form of a machined ring with cylindrical recesses for the balls and a central groove on its cylindrical surface. In order to reduce specific contact pressure between the ball and separator by creating developed linear contact between them, it is proposed that the central groove of the separator with cylindrical receptacles for the balls be made elliptical. The major axis of the ellipse passes through the circle of the ball centers and is parallel to the cylindrical surface of the separator. Illustrations 4.

Non-Nuclear Energy

USSR UDC 538.4

ACCOUNTING FOR ELECTRICAL LOSSES IN THE CHANNEL OF AN MHD-GENERATOR

Khar'kov VOPROSY GAZOTERMODINAMIKI ENERGOUSTANOVOK in Russian No 4, 1977 pp 149-155

KOSTENKO, P. P.

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 12, Dec 78 Abstract No 12.34.156]

[Text] Various schemes for calculating the load on MHD generators are examined. Universal formulas are derived for calculating the electrical parameters of a Faraday generator with either segmental or solid electrodes. A method is proposed for determining the loss factors experimentally, by comparing the electrode voltages and currents with their theoretical values. Figures 2; references 10.

Nuclear Energy

USSR UDC 621.039.61:533.92

PRELIMINARY ANALYSIS OF DESIGNS FOR A PULSED THERMONUCLEAR REACTOR DRIVEN BY RELATIVISTIC ELECTRON BEAMS

ATOMNAYA ENERGIYA in Russian Vol 45 No 1, 1978 pp 8-18

VELIKHOV, YE. P., VLASOV, V. P., VOLKOV, V. G., KOLBASOV, B. N., MURAYEV, YE. V., NEDOSEYEV, S. L., RUDAKOV, L. I., RYBAKOV, L. A., RYUTOV, V. D., TSYGANKOV, YE. A. and CHERNUKHA, V. V.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY, No 10, 1978 Abstract No 10.50.268]

[Text] Possible designs of a pulsed fusion reactor driven by relativistic electron beams are considered for both "pure" and hybrid reactors. In contrast to earlier proposals of laser driven fusion reactors, a lower pulse repetition rate ($V \approx 0.1$) is chosen with the same average thermal output ($W \approx 10^9$ W (t)). To reduce the distance for transporting relativistic electron beams, it is proposed to bring the microimplosion closer to the wall of the implosion chamber. The space beneath the target is protected by an internal blanket (layer of liquid lithium or water); above the target is placed the outer blanket (layer of lithium of thorium compound). Estimates are given of the effect of the exploding target on the first wall of the chamber and blanket material, as well as the depletion of tritium and fissile fuel in the nuclear reactor. Figures 4; references 10.

USSR UDC 621.039.524.6

ON THE POSSIBILITY OF ACOUSTIC DETECTION OF SODIUM BOILING IN A FAST REACTOR WITH THE AID OF A PULSE SYSTEM

ATOMNAYA ENERGIYA in Russian Vol 45 No 6, 1978 pp 461-463

KEBADZE, B. V., ALEKSANDROV, K. A. and GOLOVANOV, V. V.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 3, 1979 Abstract No 3.50.184]

[Text] The possibility of a detection system in which the pulsed nature of signals is utilized is evaluated. Figures 2.

USSR UDC 621.311.25:621.039

TECHNICAL AND ECONOMIC ASPECTS OF CENTRAL HEATING FURNISHED BY NUCLEAR BOILERS

ATOMNAYA ENERGIYA in Russian Vol 46 No 1, 1979 pp 3-9, 71

YEMEL'YANOV, I. YA., BATUROV, B. B., KORYTNIKOV, V. P., KORYAKIN, YU. I., CHERNYAYEV, V. A., KOVYLYANSKIY, YA. A. and GALAKTIONOV, I. V.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 3, 1979 Abstract No 3.50.64]

[Text] Questions of using nuclear reactors for central heating in single-function heat providing apparatus--nuclear boilers--are investigated. Experience in organizing centralized heating by fossil fuel boilers is analyzed. Conditions of assurance and means of enhancement of economic competitiveness of system of centralized heat supply with nuclear boilers are examined. Figures 5; tables 1; references 6.

USSR UDC 621.039.52.034.3(02)

HYDRODYNAMICS AND HEAT-EXCHANGE IN HIGH-TEMPERATURE NUCLEAR REACTORS WITH SPHERICAL FUEL ELEMENTS

Moscow GIDRODINAMIKA I TEPLOOBMEN V VYSOKOTEMPERNYKH YADERNYKH REAKTORAKH S SHAROVYMI TVELAMI in Russian Atomizdat, 1978 pp 112

BOGOYAVLENSKIY, R. G.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 10, 1978 Abstract No 10.50.28K]

[Text] The book is devoted to problems of hydrodynamics and heat exchange occurring in the planning and operation of high-temperature gas-cooled thermal and fast reactors with spherical macro- and micro-fuel elements. A physical model of flow of gaseous coolant through various arrangements of spherical fuel elements and microfuel elements in channelless and channel-type cores is proposed. Structures of spherical cells and the relation of parameters to volumetric porosity are analyzed. Theoretical calculations are given for the coefficient of drag of a jet in a spherical element, methods and results of experimental work on hydrodynamic drag, average and local coefficient of heat transfer in flow of a gas through various arrangements of spherical fuel elements are cited. Based on

generalized dimensionless parameters for the coefficients of drag and heat exchange, methods are developed for optimized calculation of the size of spherical fuel elements and geometric dimensions of cores for various volumetric densities of heat flux. Quantitative calculations on the proposed methods are cited.

USSR UDC 621.039.534

DYNAMICS OF REGENERATOR-EVAPORATOR WITH DISSOCIATING COLLANT

Kiev MODELIROVANIYE DINAMICHESKIKH PROTSESSOV ENERGOUSTANOVOK [Simulating Dynamic Processes of Power Plants] in Russian 1978 pp 95-104

TASHCHILOVA, E. M., SHAROVAROV, G. A. and TASHCHILOVA, A. M.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 10, 1978 Abstract No 10.50.151]

[Text] Research was conducted on the dynamics of a regenerator-evaporator with dissociating coolant. Based on this research, a mathematical model is devised which describes unsteady processes of heat and mass exchange in these regenerators, allowing for the effect of chemical reactions occurring in the coolants. The model devised was realized using a Minsk-22 digital computer. Figures 4; references 8.

USSR UDC 621.039.534

CHEMICAL AND RADIOCHEMICAL PROPERTIES OF SODIUM COOLANT

Dresden PROBLEMY TEKHNOLOGII I KORROZII V NATRIYEVOM TEPLONOSITELE I ZASHCHITNOM GAZE [Problems of Technology and Corrosion in Sodium Coolant and Shielding Gas] in Russian Vol 1 1977 pp 33-45

KONOVALOV, E. YE., LASTOV, A. I., SMIRNOV-AVERIN, A. P., BAGRETSOV, V. F., BUKEVICH, B. A., KORNILOV, A. S. and KUPRIYENKO, V. I.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 10, 1978 Abstract No. 10.50.144]

[Text] Various kinds and states of impurities are described, on which the properties of sodium coolant greatly depend. Impurities are present in

liquid metal loops in three basic physical states: in dissolved form, in the form of particles of excess solid phase, and as deposits on the inner surfaces of conduits. Impurities are found in the coolant in different chemical forms: in elemental form and as chemical compounds with surrounding atoms of metal and atoms of other impurities. Figures 8; tables 3; references 17.

USSR UDC 621.039.534.63:620.193

EXPERIENCE GAINED IN SODIUM TECHNOLOGY IN SOVIET FAST REACTORS

Dresden PROBLEMY TEKHNOLOGII I KORROZII V NATRIYEVOM TEPLONOSITELE I ZASHCHITNOM GAZE [Problems of Technology and Corrosion in Sodium Coolant and Shielding Gas] in Russian Vol 2 1977 pp 205-214

KARPOV, A. V., ARKHIPOV, V. M., ARKHANGEL'SKIY, V. V., IVANENKO, V. N. and SMIRNOV, A. M.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 10, 1978 Abstract No 10.50.148]

[Text] Experience in solving fundamental problems of sodium technology obtained in operation of Soviet fast reactors is briefly presented. Tables 2; references 11.

USSR UDC 621.039.542.344

CARBIDE FUEL FOR FAST REACTORS

Moscow REAKTORNOYE MATERIALOVEDENIYE TRUDY KONFERENTSII PO REAKTORNOMU MATERIALOVEDENIYU [Reactor Material Science Conference Proceedings] Alushta, 1974 in Russian Vol 4 1978 pp 32-54, 31

RESHETNIKOV, F. G., KOTEL'NIKOV, R. B., DRUZHININ, L. K., TITOV, G. V., ROGOZKIN, B. D., SHLEPOV, I. A., BRAZHNIKOV, A. F., SHISHKOV, M. G., and SAFONOV, B. V.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 3, 1979 Abstract No 3.50.151]

[Text] Some technological aspects of producing mixed U-Pu carbide fuel

for rod and vibration compacted fuel elements are considered. Two technological schemes of production of tablet fuel for rod fuel elements made of oxide and metal and two technological schemes of production of spheroidized fuel for vibration compacted fuel elements by means of spheroidization in high-frequency plasma and thermocentrifugal sputtering are analyzed. Figures 8; tables 4; references 5.

USSR UDC 621.039.54

BEHAVIOR AND SOME PROPERTIES OF URANIUM-PLUTONIUM OXIDE CORES OF FAST REACTOR FUEL ELEMENTS

Moscow REAKTORNOYE MATERIALOVEDENIYE TRUDY KONFERENTSII PO REAKTORNOMU MATERIALOVEDENIYU [Reactor Material Science Conference Proceedings] Alushta, in Russian 1974 Vol 4 1978 pp 101-117, 99

MAN'SHIKOVA, T. S., GOLOVNIN, I. S., FILATKINA, V. P., SYTOV, L. I., KOROSTIN, O. S., DAVYDOV, YE. F. and KUZ'MIN, V. I.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 3, 1979 Abstract No 3.50.175]

[Text] Some properties and the behavior of $UP4O_2$ cores under pre- and post-reactor conditions are presented. Figures 7; references 9.

USSR UDC 621.039.543.4.001.5

INTRAREACTOR RESEARCH OF THERMOPHYSICAL CHARACTERISTICS OF CONTAINER TYPE FUEL ELEMENTS USING URANIUM DIOXIDE FUEL

Moscow REAKTORNOYE MATERIALOVEDENIYE TRUDY KONFERENTSII PO REAKTORNOMU MATERIALOVEDENIYU [Reactor Material Science Conference Proceedings] Alushta in Russian Vol 4 1978 pp 165-180, 164

TSYKANOV, V. A., SAMSONOV, B. V., SPIRIDONOV, YU. G., and ABAN'KIN, A. K.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 3, 1979 Abstract No 3.50.167]

[Text] The authors describe methods of studying heat conductivity of uranium dioxide and fuel-cladding contact conductivity during the operation

of fuel elements in a nuclear reactor. Results on these characteristics are obtained for container type fuel elements with compact UO_2. Figures 5; table 1; references 14.

USSR UDC 621.039.543:536.2.001.5

STUDY OF HEAT CONDUCTIVITY OF URANIUM DIOXIDE IN THE TEMPERATURE RANGE OF 300 TO 3000 KELVINS

Moscow REAKTORNOYE MATERIALOVEDENIYE TRUDY KONFERENTSII PO REAKTORNOMU MATERIALOVEDENIYU [Reactor Material Science Conference Proceedings] Alushta, in Russian 1974 Vol 4 1978 pp 213-231, 212

BARANOV, V. G., GODIN, YU. G., SAYFUTDINOV, R. M., ZHIDKOV, B. A., and KUSHAKOVSKIY, V. I.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 3, 1979 Abstract No 3.50.165]

[Text] A study was made on the heat conductivity of uranium dioxide in the 300 to 3000 kelvin range. The influence that redistribution of oxygen along the radius of the specimen under the action of a thermal gradient has on heat conductivity was studied. It was assumed that increased heat conductivity of uranium dioxide at temperatures greater than 1700 K was due to the increased heat capacity of UO_2 due to the formation of complex oxygen defects. Figures 4; tables 4; references 17.

USSR UDC 621.039.54.001.5

STRUCTURAL CHANGES AND BEHAVIOR OF GASEOUS PRODUCTS OF FISSION IN IRRADIATED URANIUM DIOXIDE

Moscow REAKTORNOYE MATERIALOVEDENIYE TRUDY KONFERENTSII PO REAKTORNOMU MATERIALOVEDENIYU [Reactor Material Science Conference Proceedings] Alushta 29 May-1 June 1978 in Russian Vol 3 1978 pp 253-276, 252

SAMSONOV, B. V.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 3, 1979 Abstract No 3.50.169]

[Text] The theoretical distinction between gas bubbles in irradiated UO_2 and experiments on gas liberation conducted after extraction of irradiated specimens from a nuclear reactor is shown. In the irradiation process fission gas emerges from the fuel as gas bubbles 20 angstroms in diameter, migrating in the crystal by Brownian movement. It was also shown that during irradiation there is an increase in open surface of UO_2. Based on these two factors, a phenomenological model is devised which aids in computing the outflow of gas and change in the volume of fuel in the container-type fuel element. Figures 11; references 12.

USSR UDC 621.039.542.34:621.039.531

EMISSION OF GASEOUS PRODUCTS OF FISSION IN PLASTIC DEFORMATION OF POLYCRYSTALLINE CERAMIC FUEL DURING IRRADIATION

Moscow REAKTORNOYE MATERIALOVEDENIYE TRUDY KONFERENTSII PO REAKTORNOMU MATERIALOVEDENIYU [Reactor Material Science Conference Proceedings] Alushta, 29 May-1 June 1978 in Russian Vol 3 1978 pp 278-286, 277

NABOYCHENKO, K. V., YELESIN, V. F., ZOLOTUKHA, YU. S., and MINAYEV, YE. M.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 3, 1979 Abstract No 3.50.164]

[Text] A theoretical model that describes the emission of gaseous fission products in plastic deformation of polycrystalline specimens of fissile material during irradiation is considered. In the model the authors examine the polycrystalline structure of the specimen and the fact that emission of gas occurs from grains in contact with one another is taken into account. Accordingly their outer surface has regions of expansion and

contraction. An analytical solution is found for a nonstationary equation of diffusion-convection transfer for a half-plane which is used to describe experiment results on omission of Kr^{88} and Xe^{138} from UO_2. Calculations agree satisfactorily with experiment. Figures 3; references 4.

USSR UDC 621.039.53

RADIATION HARDENING AND EMBRITTLEMENT OF ALLOYS DUE TO REACTOR IRRADIATION

Dimitrovgrad SBORNIK DOKLADOV VSESOYUZNOY SHKOLY PO VNUTRIREAKTORNYM METODAM ISSLEDOVANIYA [Collected Reports of the All-Union School on Intrareactor Methods of Research, 1977] in Russian 1978 pp 49-85

PROKHOROV, V. I.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 10, 1978 Abstract No 10.50.168 by F. P. Shamashov]

[Text] The most common experimental results obtained after irradiation are discussed, including high dose irradiation, as well as modern notions of plastic deformation in irradiated alloys and the mechanics of radiation hardening. The behavior of body-centered cubic metals is more complicated than face-centered cubic metals due to interaction of radiation defects with interstitial impurities. Flow resistance of Fe, Mo, Nb, Ta and V strongly depends on temperature without irradiation, and general effect of irradiation consists in displacement of the entire flow resistance versus temperature curve toward higher resistances. To refine the mechanics of radiation hardening of body-centered cubic and hexagonal close-packed metals, it is necessary to draw upon thermoactivation analysis and internal friction in addition to electron microscopy. From experiments with irradiation in type SM-2 nuclear reactor at 300°C, a correlation was derived between low-temperature embrittlement and grain size of steel 16-15 in high nickel alloy 20-45 up to a fluence of 2×10^{22} neutron/cm^2, $E > 0.1$ MeV. Steel in the coarse-grained state showed the least reduction in uniform longitudinal extension. Despite evident utility of post-radiation data, the mechanical stress-strain characteristics must be obtained directly under irradiation for theoretical and experimental purposes. Figures 22; references 24.

USSR UDC 621.039.6

PRELIMINARY ANALYSIS OF A HYBRID PULSED THERMONUCLEAR REACTOR USING RELATIVISTIC ELECTRON BEAMS (GITREP)

Moscow SINTEZ-DELENIYE. TRUDY VTOROGO SOVETSKO-AMERIKANSKOGO SEMINARA, MOSKVA, 14 Mar-1 Apr 1977 [Fusion-Fission. Proceedings of the Second Soviet-U.S. Seminar, Moscow, 14 Mar-1 Apr 1977] in Russian 1978 pp 283-286

VELIKHOV, YE. P., KOLBASOV, B. N., MURAV'YEV, YE. V., NEDOSEYEV, S. L., RUDAKOV, L. I., RYBAKOV, A. L., TSYGANKOV, YE. A. and CHERNUKHA, V. V.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 3, 1979 Abstract No 3.50.275]

[Text] A variant of the GITREP plan with average thermal capacity of thermonuclear neutrons of about 10^3 MW is considered for an implosion repetition rate γ = 0.1 to 10 Hz. Basic problems of pulsed thermonuclear reactors under these conditions are problems of operating life of the implosion chamber and the problem of explosive effects on the final stages of the thermonuclear reaction initiation system. In particular, for pulsed thermonuclear reactors with electron beams, it is necessary to find an effective means of protecting the acceleration tube (isolator) which separates the vacuum portion from the high-voltage shaping lines against contamination by explosive by-products. Some principles of pertinent problem solving are briefly analyzed. References 4.

USSR UDC 621.039.542:536.24.001.5

STUDY OF HEAT EXCHANGE CONDITIONS TYPICAL OF EMERGENCY SHUT-DOWN OF BOILING-WATER CHANNEL REACTORS

Moscow TRUDY MOSKOVSKOGO ENERGETISCHESKOGO INSTITUTA [Proceedings of Moscow Power Engineering Institute] in Russian 1978 No 374 pp 92-95

KABANOV, L. P. and BELYAYEV, S. A.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 3, 1979 Abstract No 3.50.73]

[Text] Problems of studying transcritical heat exchange typical for two cases of cooling fuel elements in boiling-water channel type nuclear reactors are formulated. The first is connected with conditions of cooling fuel elements by reflux of water and steam at low flow rates occurring in

the rupture of several conduits in partial section which leads to critical conditions of heat exchange in downflow. The second occurs when feeding coolant water into dried fuel elements, heated up after expulsion of heat transfer agent, where conditions of transcritical heat exchange can occur due to high initial temperatures of fuel element cladding. Figures 2; references 3.

USSR UDC 621.039.546.3

ON THE FEASIBILITY OF LOCATING DEFECTIVE CASSETTES BY A METHOD OF CLADDING INTEGRITY CHECKING WITH OVERCOMPENSATION IN WATER-COOLED WATER-MODERATED POWER REACTORS

TRUDY VSESOYUZNOGO TEPLOTEKHNICKESKOGO NAUCHNO-ISSLEDOVATEL'SKOG INSTITUTA [Proceedings of the All-Union Heat Engineering Research Institute] in Russian 1978 No 19 pp 124-130

GRIDNEV, S. P. and LOMAKIN, S. S.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 3, 1979 Abstract No 3.50.100]

[Text] The authors consider possibilities of locating defective cassettes that have lost integrity directly in operating water-cooled water-moderated nuclear power reactors by checking the integrity of fuel element cladding with respect to delayed neutrons with overcompensation of the field of energy release using computer methods of experiment data processing. Figure 1; references 6.

USSR UDC 621.039.53

DISTINCTIVE FEATURES OF OPERATION OF METAL MATERIALS OF HELIUM-COOLED FAST REACTORS

Moscow VOPROSY ATOMNOY NAUKI I TEKHNIKI. SERIYA ATOMNO-VODORODNAYA ENERGETIKA [Problems of Nuclear Science and Technology. Series on Atomic-Hydrogen Power Engineering] in Russian No 1/4, 1978 pp 135-141

ARTEMOVA, YE. N., BALANDIN, YU. F., BEREZHKO, B. I., GRIBOV, N. N., DUSHIN, YU. A., IGNATOV, V. A., NIKOLAYEV, V. A., PARSHIN, A. M., and SOLOMKO, YU. V.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 10, 1978 Abstract No 10.50.162]

[Text] The effect of helium coolant on alteration of mechanical properties of materials is determined. For a series of subassemblies and constructions, questions associated with the phenomenon of helium permeability of materials are resolved. Processes of high-temperature embrittlement of austenitic steels and alloys and the related alteration of their mechanical properties are examined. Figures 4; tables 2; references 4.

USSR UDC 621.039.534.230.001.2

QUANTITATIVE EVALUATION OF THE EFFECT OF OPERATIONAL FACTORS ON OPERATING LIFE OF REACTOR CORE ELEMENTS

Moscow VOPROSY ATOMNOY NAUKI I TEKHNIKI. SERIYA FIZIKI I TEKHNIKI YADERNYKH REAKTOROV [Problems of Nuclear Science and Technology. Series on Reactor Physics and Technology] in Russian 1978 No 3/3 pp 22-27

GERASIMOV, V. V., YEMEL'YANOV, I. YA. and NOVINSKIY, YE. YU.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 3, 1979 Abstract No 3.50.81]

[Text] The effect of irradiation on the distance traversed by a dislocation until it is blocked by an obstacle is examined. A connection is shown between the rate of travel of the dislocation and the intensity and dose of neutron irradiation. An equation is cited for quantitative evaluation of the effect of mechanical stresses, temperature, intensity of neutron irradiation and composition of corrosive medium on the operating life of core elements. Table 1; references 7.

USSR UDC 621.039.5:621.928.3

RESULTS OF EXPERIMENTAL STUDY OF CERTAIN ELEMENTS OF INTRAVESSEL DEVICES OF SEPARATOR BLOCKS

Moscow VOPROSY ATOMNOY NAUKI I TEKHNIKI. SERIYA FIZIKI I TEKHNIKI YADERNYKH REAKTOROV [Problems of Nuclear Science and Technology. Series on Reactor Physics and Technology] in Russian No 1/21, Part 2, 1978 pp 45-53

KARASEV, V. B., BULANKOV, YU. V., GLAZKOV, O. M., AGEYEV, A. G., DUBROVSKIY, I. S. and AFANAS'YEV, B. P.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 10, 1978 Abstract No 10.50.202]

[Text] Basic requirements are presented for separation systems of boiling-water channel-type vessel nuclear reactors. A description is given of theoretical design of intravessel devices of the vertical separator block of the RBM-KP-2400 nuclear reactor. Results are given of experimental study of improved design of a primary axial separator and a mock-up of a separator block. The elaborated design of an axial separator may be recommended for use in separation systems of channel-type nuclear reactors of RBM-KP class. Figures 7; references 5.

USSR UDC 621.039.520.21.001.24

PROBABILITY REPRESENTATION OF HETEROGENEOUS SYSTEMS

Moscow VOPROSY ATOMNOY NAUKI I TEKHNIKI. SERIYA FIZIKI I TEKHNIKI YADERNYKH REAKTOROV [Problems of Nuclear Science and Technology. Series on Reactor Physics and Technology] in Russian No 1/21, Part 2, 1978 pp 93-99

ARTAMKIN, V. N. and KOLESNIKOV, YU. I.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 10, 1978 Abstract No 10.50.46]

[Text] Using probabilities of the first collision, macroscopic characteristics of the albedo type are derived for the cylindrical region, making possible, in all stages of calculation, the separate consideration of neutrons formed in the homogenized region and those entering from the outside. This may be useful in investigating complex systems with localized

absorbers. A method is presented for deriving such characteristics based on solution of kinetic equations and possible methods of its use are considered for solving reactor problems. Figure 1; references 4.

USSR UDC 621.039.5:62-46

QUESTIONS OF STRENGTH OF PROCESS CHANNELS OF RVM-K REACTORS

Moscow VOPROSY ATOMNOY NAUKI I TEKHNIKI. SERIYA FIZIKI I TEKHNIKI YADERNYKH REAKTOROV [Problems of Nuclear Science and Technology. Series on Reactor Physics and Technology] in Russian No 1/21, Part 2, 1978 pp 105-113

RIVKIN, YE. YU.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 10, 1978 Abstract No 10.50.192]

[Text] Data are cited which describe the effect of irradiation on creep, long-term strength, and resistance to brittle fracture of zirconium pipes of process channels. Irradiation increases the rate of creep, but also the long-term strength of zirconium alloys. A nomogram is devised for calculating resistance to brittle fracture of zirconium pipes of process channels. Resistance to brittle fracture of these pipes is ensured for entire service life. Figures 8; tables 2; references 15.

USSR UDC 621.039.53:620.193

CORROSION RESISTANCE OF CONSTRUCTION MATERIALS UNDER OPERATING CONDITIONS OF NUCLEAR ELECTRIC POWER PLANTS WITH BOILING-WATER REACTORS

Moscow VOPROSY ATOMNOY NAUKI I TEKHNIKI. SERIYA FIZIKI I TEKHNIKI YADERNYKH REAKTOROV [Problems of Nuclear Science and Technology. Series on Reactor Physics and Technology] in Russian No 1/21, Part 2, 1978 pp 124-132

GERASIMOV, V. V., GROMOVA, A. I., BELOUS, V. N., SHUT'KO, I. G. and MOROZOVA, I. K.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 10, 1978 Abstract No 10.50.158]

[Text] The use of construction materials of the circulation loop of a boiling-water nuclear reactor is justified for steel types of the austenitic, perlitic classes and zirconium alloys. The mechanism of corrosion of construction materials is described; quantitative estimates are given for corrosion of construction materials versus operating factors. It is possible to use perlite steels under operating conditions of boiling-water nuclear reactors. Figures 6; table 1; references 8.

USSR UDC 621.039.6(088.8)

VACUUM CHAMBER OF A THERMONUCLEAR REACTOR

Author's certificate, USSR, cl. C 21 B 1/00, No 528805, filed 11 Jul 75, No 2154783, published 17 Nov 77

IZOTOV, YE. N., MALYSHEV, I. F., MESHCHERYAKOV, YU. M. and ODINTSOV, V. N.

[From REFERATIVNYY ZHURNAL, 50, YADERNYYE REAKTORY, OTDEL'NYY VYPUSK No 10, 1978 Abstract No 10.50.274]

[Text] A vacuum chamber is proposed which contains equatorially sectioned discharge and vacuum chambers with radiation shields. To increase reliability of hermetic seals and ensure radiation shielding, at the ends of each sector of the discharge chamber are coaxial adapters whose outer cylinder is made in the form of a bellows with dielectric annular diaphragm; the diameter of the inner opening of the diaphragm is greater than the external diameter of the bellows, and the inner cylinders of

contiguous sections are hermetically connected in the gap between diaphragms, where the radiation shield is positioned.

USSR UDC 621.039:66.045.1(088.8)

DIRECT-FLOW HEAT EXCHANGE REACTOR

Author's certificate, USSR, cl. F 28C 3/06; B 01 j 1/00, No 569834, filed 1 Dec 75, No 2195398, published 25 Oct 77

DOMANSKIY, V. I. and KUZNETSOV, V. K., Leningrad Technological Institute

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 10, 1978 Abstract No 10.50.120P]

[Text] A direct-flow heat exchange nuclear reactor is proposed which contains circulation and contact pipes placed in a housing that is fastened between tube sheets, and liquid and gas feed and outflow connection pieces set under the lower tube sheet and above the upper one respectively. To raise productivity and ensure uniform feed of liquid, liquid feeder nozzles are coaxially mounted in the lower ends of the contact pipes. The intake apertures of the nozzles are arranged above the lower end of the circulation pipe.

USSR UDC 629.7.036.3

AN AUTOMATIC MEASURING AND DATA PROCESSING SYSTEM FOR THE STUDY OF RAPIDLY VARYING PROCESSES

Ufa ISPYTANIYA AVIATSIONNYKH DVIGATELEY [Testing of Aircraft Engines] in Russian No 6, 1978 pp not given

GOLOVATYY, V. I., DURASOV, B. A. and IVASHIN, YU. S.

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 3, Mar 79 Abstract No 3.34.87]

[Text] An automatic measuring and data processing system on the basis of a NAIRI-2 digital computer is described. The system includes fast-response measuring instruments with amplitude modulation and an ATsPK-100-11/2 analog-digital converter with a discretization frequency up to 13 kHz, allowing the system to record rapidly varying processes. The memory of the NAIRI-2 digital computer has been upgraded to facilitate input of data to it from the analog-digital converter. The maximum number of recordable parameters is 8 analog and 76 discrete ones. The system is intended for the study of rapidly varying processes during tests performed on pneumohydraulic systems and combustion chambers. An example is shown of evaluating the transient process in a component of a pneumohydraulic system. The data processing time is 3 min and the error in determining the output parameters is within 1.5-2%. Figures 4; tables 1.

USSR UDC 629.7.036.3.001.4

NON-CONTACT MEASUREMENT WITH MAGNETIC RECORDING OF THE VIBRATION CHARACTERISTICS OF COMPRESSOR RUNNER BLADES IN A GAS TURBINE ENGINE

Ufa ISPYTANIYA AVIATSIONNYKH DVIGATELEY [Testing of Aircraft Engines] in Russian No 6, 1978 pp 65-70

ZIMAKOVA, T. G., KOROSTELEV, YU. A., MAKSIMOV, V. P. and RODOV, A. YA.

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 3, Mar 79 Abstract No 3.34.82]

[Text] The runner blade vibration indicating-signalling instrument ELURA-5 and its operating principles are briefly described, of particular interest being the possibility of its operation together with a tape

recorder. Considered are automatic activation of the recorder, application of the entire equipment for data accumulation during an experiment and subsequent computer-aided processing, and the feasibility of its unmanned operation on ground as well as in flight. Figures 2.

USSR UDC 621.039.564:539.1.074

DEVICES FOR DETECTING LOW ENERGY CHARGED PARTICLES FOR USE IN AEROSPACE EXPERIMENTS (REVIEW)

Moscow VOPROSY ATOMNOY NAUKI I TEKHNIKI. YADERNOYE PRIBOROSTROYENIYE [Problems of Nuclear Science and Technology. Nuclear Instrument Making] in Russian 1978 No 38 pp 16-32

KOVALENKO, V. G.

[From REFERATIVNYY ZHURNAL, YADERNYYE REAKTORY No 3, 1979 Abstract No 3.50.255]

[Text] A description is given of the basic methods of detecting charged particles of low energy. Among detectors utilized in space, greatest attention is called to open channel and secondary-electron multipliers whose use is most promising. Analyzing devices are cited, primarily those of the electrostatic deviation analyzer type. Analyzers and detectors with high sensitivity for measuring low energy charged particle fluxes are examined. Figures 4; tables 2; references 71.

USSR UDC 629.7.036:531.7(088.8)

A DEVICE FOR AUTOMATIC MEASUREMENT OF THE ELECTRICAL CONDUCTIVITY OF PLASMAS

USSR Patent Class G 01 R 27/22 No 577477, filed 18 May 76 (No 2356318), published 26 Nov 77

KRUGLYY, S. I., KOLOKOL'TSOVA, A. L., MALYUZHONOK, G. P., OBERMAN, F. M. and MELKOV, YE. M., Institute of High Temperatures at the USSR Academy of Sciences

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 12, Dec 78 Abstract No 12.34.112 P]

[Text] The object of this invention is to improve the measurement accuracy. This is achieved by adding to the instrument a logic commutator and connecting the latter through controllable switches to the measuring coil and the compensating coil, both wound bifilarly, with the windings of the measuring coil connected opposing through one of the normally open switch and the windings of the compensating coil connected aiding through the other normally open switch. Figures 2.

Turbine and Engine Design

USSR UDC 629.7.036.3.001.4

REFINEMENT OF THE MATHEMATICAL MODEL OF A COMPRESSOR ON THE BASIS OF TEST DATA PERTAINING TO A GAS TURBINE ENGINE

Ufa ISPYTANIYA AVIATSIONNYKH DVIGATELEY [Testing of Aircraft Engines] in Russian No 6, 1978 pp 24-29

YULDYBAYEV, L. KH., MAGADEYEV, A. YA., GUMEROV, KH. S. and ALATORTSEV, V. P.

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 3, Mar 79 Abstract No 3.34.11]

[Text] Under consideration is the problem of refining, on the basis of test data pertaining to a gas turbine engine, the mathematical model of its compressor in the form of polynomials used in the algorithm by which the characteristics of that engine are calculated. Refinement of this model of a compressor is the very first and a necessary step toward construction of an adequate model of the entire engine system. Figures 5; references 8.

USSR UDC 629.7.036.3:621.43.056

ATOMIZATION PROCESSES IN A COMBUSTION CHAMBER WITH COUNTERFLOW FEED OF PRIMARY AIR AND PNEUMATIC SPRAY

Ufa ISPYTANIYA AVIATSIONNYKH DVIGATELEY [Testing of Aircraft Engines] in Russian No 6, 1978 pp 77-84

SARKISOV, A. A., SUNARCHIN, R. A., NADYRSHIN, A. YA., GRISHIN, A. N., TUK, YE. F. and BOL'SHAGIN, V. I.

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 3, Mar 79 Abstract No 3.34.6]

[Text] The results of an experimental study are presented pertaining to the atomization processes in a combustion chamber with counterflow feed of primary air. These results indicate how the relative fuel flow intensity and the sprayer construction affect the quality and the uniformity of fuel distribution. Figures 8; references 3.

USSR UDC 621.438.081

EFFECT OF CONVECTIVE FILM COOLING OF TURBINE NOZZLES ON THE TURBINE EFFICIENCY STUDIED ON A TURBOJET ENGINE WITH A SINGLE-STAGE TURBINE

Ufa ISPYTANIYA AVIATSIONNYKH DVIGATELEY [Testing of Aircraft Engines] in Russian No 6, 1978 pp 100-107

KOPELEV, S. Z. and ZIKEYEV, V. V.

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 3, Mar 79 Abstract No 3.34.20]

[Text] The results of a comparative study are analyzed pertaining to changes in the turbine efficiency due to convective film cooling of the turbine nozzles, with the air discharged over the surfaces of vane blades as an alternative to plain convective cooling. The study, made on a single-stage turbine operating within the complex of a high-temperature turbojet engine, has revealed that convective film cooling lowers the turbine efficiency. Figures 2; tables 1; references 1.

USSR UDC 621.165-531

CHARACTERISTICS OF HIGH-POWER CENTRAL-HEATING TURBINE PLANTS WITH SLIDING INITIAL STEAM PRESSURE

Kiev MODELIROVANIYE DINAMICHESKIKH PROTSESSOV ENERGOUSTANOVOK [Simulation of the Dynamic Processes in Power Plants] in Russian 1978 pp 25-29

IVANOV, V. A. and MEL'NIKOV, B. N.

[From REFERATIVNYY ZHURNAL, TURBOSTROYENIYE No 11, Nov 78 Abstract No 11.49.79]

[Text] It is demonstrated that composite programming of the regulation (fixed pressure - sliding pressure) in central-heating turbine plants will ensure an economical operation of interconnected power systems with heat and electric plants [TETS] constituting a large portion of the installed capacity. Figures 1; references 4.

USSR UDC 621.438

POSSIBLE APPLICATIONS FOR AND ENERGY CHARACTERISTICS OF SMALL 2-RUNNER HIGH-HEAD TURBINES

Khar'kov SAMOLETOSTROYENIYE, TEKHNIKA VOZDUSHNOGO FLOTA, RESPUBLIKANSKIY MEZHVEDOMSTVENNY NAUCHNO-TEKHNICHESKIY SBORNIK [Aircraft Construction, Air Fleet Engineering, Republic Interdepartmental Scientific and Technical Collection] in Russian No 44, 1978 pp 10-14

GOLDAYEV, I. P., IL'INSKIY, V. V. and SKVORCHEVSKIY, YE. A.

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 12, Dec 78 Abstract No 12.34.53]

[Text] The energy characteristics of a 2-runner turbine are analyzed. It is found that a 2-shaft construction of a set with the two wheels running at different speeds ensures a higher efficiency of a power plant working with hot gas under high pressure. Calculations have also revealed that using a 2-runner turbine instead of a single-runner one is so effective as to almost double the power output of the set with only relatively small increases in weight, size, and fuel consumption at the same level. Figures 2; tables 1; references 2.

USSR UDC 62.793.8

PROTECTIVE COATING FOR GAS TURBINE ENGINE VANES

Riga TEKHNIKA EKSPLUATATSII LETATEL'NYKH APPARATOV I AVIATSIONNYKH DVIGATELEY [Technology of Utilizing Aircraft Engines and Flightcraft] in Russian 1977 pp 95-97

SHEVCHUK, L. A.

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 10, 1978 Abstract No 10.34.114]

[Text] Results are presented for development of optimum chemical composition of a coating containing zirconium and aluminum, applicable to heat-resistant alloys, to improve operating properties of gas turbine engine vanes. Research was conducted on alloys VZhL12U and EI867VD. Application of coatings was done from suspensions according to previously elaborated methods. Quantity of zirconium in suspension ranged from 5 to 60% (by weight). With increased content of zirconium there is a decrease

of depth of the diffusion layer as compared with aluminizing. At the same time the microhardness of the layer is reduced, while ductility is increased. Research showed that best coatings on heat-resistant alloys are obtained at 950°C for 15-30 minutes with a content of suspended zirconium of 10-30% by weight. Higher temperatures are undesirable because of possible warping and buckling of parts. Depth of diffusion layer versus initial quantity of suspension is linear under selected conditions of saturation: this permits accurate control of the coating depth. Figures 2; references 4.

USSR UDC 621.175:536.248.2

APPLYING THE THEORY OF CONDENSATION KINETICS TO THE DESIGN OF STEAM TURBINES

Leningrad TEMPERATURNYY REZHIM I GIDRAVLIKA PAROGENERATOROV [Temperature Conditions and Hydraulics of Steam Generators] in Russian 1978 pp 102-116

KACHURINER, YU. YA. and YABLONIK, R. M.

[From REFERATIVNYY ZHURNAL, TURBOSTROYENIYE No 11, Nov 79 Abstract No 11.49.19]

[Text] The parameters of the vapor phase and of the liquid phase in a high-velocity stream are calculated, for the case where nonequilibrium condensation of the water vapor takes place near the upper limiting curve over a wide range of pressure variation. Figures 7; references 20.

USSR UDC 62-135:533.6.011:536.2

VENTILATION LOSSES DURING IDLING OF THE RUNNER OF AN AXIAL-FLOW TURBINE

Leningrad TRUDY LENINGRADSKOGO KORABLESTROITEL'NOGO INSTITUTA [Transactions of Leningrad Shipbuilding Institute] in Russian No 121, 1977 pp 49-53

MAGIDENKO, YA. YE. and YUVKO, A. I.

[From REFERATIVNYY ZHURNAL, TURBOSTROYENIYE No 11, Nov 78 Abstract No 11.49.29]

[Text] The results of experimental studies are presented pertaining to the effect of the convergence of the interblade passageway and of the relative width of the working cascade on the ventilation losses. References 10.

USSR UDC 62-135:533.6.011

DETERMINING THE PARAMETERS IN THE THROAT OF A BLADE ARRAY

Leningrad TRUDY LENINGRADSKOGO KORABLESTROITEL'NOGO INSTITUTA [Transactions of Leningrad Shipbuilding Institute] in Russian No 121, 1977 pp 100-103

TOPUNOV, A. M., YEGOROV, V. V. and POGODIN, YU. M.

[From REFERATIVNYY ZHURNAL, TURBOSTROYENIYE No 11, Nov 78 Abstract No 11.49.28]

[Text] Analytical expressions are derived for calculating the gas velocity in the throat of a blade array, behind a supersonic discharge of the working substance, with various thermodynamic effects taken into account. References 2.

USSR UDC 629.7.036.54

ATMO-JET ENGINES

Moscow TRUDY ODINNADTSATYKH CHTENIY, POSVYASHCHENNYKH RAZRABOTKE NAUCHNOGO NASLEDIYA I RAZVITIYU IDEY K.E. TSIOLKOVSKOGO, KALUGA 1976, SEKTSIYA: PROBLEMY RAKETNOY I KOSMICHESKOY TEKHNIKI [Transactions of the Eleventh Lectures on Elaboration of the Scientific Heritage and Development of K. E. Tsiolkovskiy's Ideas, Kaluga 1976, Section: Problems of Rocket and Space Technology] in Russian 1978 pp 167-174

MERKULOV, I. A. and MERKULOV, I. I.

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 12, Dec 78 Abstract No 12.34.99]

[Text] The aim of this study is to extend Tsiolkovskiy's ideas and the basic premises of Stechkin's theory to engines operating in the atmospheres of other planets such as, for example, those of Venus, Mars, or Jupiter. Generally the working fluid that describes a given thermodynamic cycle in the engine will be not air but some other mixture of gases. These engines, which generate thrust by adding to the momentum of the incoming atmospheric gas stream, are called atmo-jet engines. References 3.

USSR UDC 621.438(088.825)

A GAS TURBINE PLANT

USSR Patent Class F 02 C 1/06 No 270399, filed 25 Apr 66 (No 1072080), published 28 Mar 78

DIKIY, N. A.

[From REFERATIVNYY ZHURNAL, TURBOSTROYENIYE No 11, Nov 78 Abstract No 11.49.119 P]

[Text] A gas turbine plant is proposed which includes a compressor with an interstage evaporator-cooler and an economizer utilizing the heat of flue gases. The distinguishing feature of this gas turbine plant is a surface heat exchanger placed before the economizer for preheating the cold water with the condensate from the interstage cooler and thus for better utilization of the heat of the cycle air. Figures 1.

USSR UDC 629.7.036.34(088.8)

A 3-SHAFT TURBOFAN ENGINE

USSR Patent Class F 02 k 3/04 No 368416, filed 17 May 71 (No 1653324), published 6 May 73

YENENKOV, V. G. and KLYACHKIN, A. L., Riga Institute of Civil Aviation Engineers

[From REFERATIVNYY ZHURNAL, 34. AVIATSIONNYYE I RAKETNYYE DVIGATELI OTDEL'NYY VYPUSK, No 12, Dec 78 Abstract No 12.34.73 P]

[Text] A 3-shaft turbofan engine has been patented with the distinguishing feature that, for reducing the noise without lengthening the nacelle, a part of the fan stage is connected to the intermediate-pressure stage. Figures 1.

USSR UDC 629.7.036.3-574(088.825)

A GAS TURBINE PLANT

USSR Patent Class F 02 C 7/14 No 408587, filed 11 Apr 72 (No 1770331), published 26 Nov 77

YEMIN, O. N., YERMOLINA, N. P. and NIKULIN, O. V., Moscow Institute of Aviation

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 12, Dec 78 Abstract No 12.34.54 P]

[Text] A gas turbine plant has been patented which includes a compressor behind an air turbine mechanically coupled to its shaft, and a heat exchanger behind the turbine. Cold high-pressure air is obtained by having the inlet to the coolant duct in the heat exchanger connected to the flowthrough channel of the plant behind the compressor. Figures 1.

USSR UDC 621.515(088.825)

A METHOD OF SETTING THE AXIAL-DISPLACEMENT RELAY FOR A TURBOMACHINE RUNNER

USSR Patent Class F 01 D 21/04 No 568730, filed 29 Mar 74 (No 2010658), published 15 Dec 77

BYCHKOV, L. A.

[From REFERATIVNYY ZHURNAL, TURBOSTROYENIYE No 11, Nov 78 Abstract No 11.49.178 P]

[Text] A method of setting the axial-displacement relay for a turbomachine (e.g., a centrifugal compressor) runner is proposed, namely establishing the extreme permissible position of the runner shoulder relative to the bearing support shoes. The distinguishing feature of this method is that, for better reliability, one establishes this extreme permissible position of the runner shoulder by pushing the latter against the bearing support shoes of an idle turbomachine. Figures 1.

USSR UDC 621.165-233.2(088.825)

TURBINE BEARING

Author's Certificate, USSR, class F 01 D 25/28 No 574542, filed 14 Mar 73 No 1891395/06, published 24 Oct 77

MACHNEV, B. N. and LAYER, N. M., Kolomna Locomotive Plant imeni V. V. Kuybyshev

[From REFERATIVNYY ZHURNAL, TURBOSTROYENIYE No 1, 1979 Abstract No 1.49.55 P]

[Text] A turbine support is proposed which contains side plates to neutralize thermal radial movement of the turbine housing, and a plate with a tight-fitting peg to absorb tangential forces. In order to simplify manufacture of the peg assembly and assembly of the turbine, the plate is made of two parts which are separable at the tight peg; the latter is rigidly connected to the side plates. Illustrations 3.

USSR UDC 62-135-251(088.825)

DEVICE FOR AXIAL SHIFTING OF TURBINE ROTORS

Author's Certificate, USSR, class F 01 D 25/34, No 575543, filed 3 Mar 75, No 2110172, published 24 Oct 77

KLIMOV, V. M.

[From REFERATIVNYY ZHURNAL, TURBOSTROYENIYE, No 1, 1979 Abstract No 1.49.53 P]

[Text] A device is proposed for axial shifting of steam and gas turbine rotors, containing a base attached on a bearing housing and fitted with a detent screw which interacts with the rotor coupling. To simplify and assure smooth shifting, coaxial with the screw in the base is a detent rod and roller; on the rotor coupling is a wedge. The rod has a flexible element and is double-ended. Illustrations 3.

USSR UDC 62-135-253.5:534.08(088.825)

CATHODE-RAY INSTRUMENT "ELURA" FOR MEASURING THE VIBRATIONS OF RUNNER BLADES IN A TURBOMACHINE

USSR Patent Class G 01 H 11/00 No 586342, filed 17 Aug 73 (No 1952995), published 27 Dec 77

KOROSTELEV, YU. A. and MALYSHEV, V. S.

[From REFERATIVNYY ZHURNAL, TURBOSTROYENIYE No 11, Nov 78 Abstract No 11.49.177 P]

[Text] The cathode-ray instrument "ELURA," according to USSR Patent No 236827, for measuring the vibrations of runner blades in a turbomachine is modified. For extending the functional range of this instrument, an extra pair of probes is added for mounting on blades and on the periphery respectively. This extra pair is connected electrically in parallel with the main pair of probes and is shifted physically from the latter by a half-period of the cascade. Figures 1.

USSR UDC 621.165/088.825

LOW PRESSURE REGENERATION SYSTEM FOR TURBINE APPARATUS

Author's Certificate, USSR, class F 01 K 7/40, F 22D 1/30, No 595523, filed 24 Jan 74, No 1991599, published 10 Mar 78

YEFIMOCHKIN, G. I., All-Union Scientific Research Institute of Heat Engineering

[From REFERATIVNYY ZHURNAL, TURBOSTROYENIYE No 1, 1979 Abstract No 1.49.44 P]

[Text] A low-pressure regeneration system is proposed for a turbine apparatus which contains surface heaters with staged outlet of drainage and steam-air mixture connected to the turbine via seal-relief and bleeder steam lines, and a mixing heater with horizontal baffle between the steam and water cavities connected in between the above sections. In order to increase operating reliability, deaeration capability, and reduce dimensions of the mixing heater, the steam cavity of the latter is separated by a perforated sheet into two sections, the uppermost of which is connected with the steam bleeder line, and the lowermost of which is connected with the seal-relief lines, and the air cavity is connected to the lines for drainage outlet and the steam-air mixture coming from the next surface heater on the condensate path. For the purpose of utilizing the superheat of steam entering from the seals and bleeder of the turbine, at the inlet of at least one steam line to the mixing heater is placed an additional surface heat exchanger, connected to the main condensate pressure line beyond the mixing heater. Illustration 1.

USSR UDC 621.165:621.438-251-233.2(088.825)

A ROTOR BEARING

Author's Certificate, USSR, class F 16 C 27/02, F 01 D 25/28 No 600336, filed 6 Jan 76 No 2310924, published 3 Apr 78

YAMPOL'SKIY, I. D., KIRYUKHIN, V. I., OKUNEV, E. YE. and BLAGOVESHCHENSKIY, V. V.

[From REFERATIVNYY ZHURNAL, TURBOSTROYENIYE No 1, 1979 Abstract No 1.49.54 P]

[Text] A rotor support based on Author's Certificate No 495458 is proposed. In order to increase economy, between the outer race of the bearing and springs are set transmission mechanisms, for instance lever-type. Illustration 1.

USSR UDC 629.7.036.3:533.627.2(088.8)

INERTIAL SEPARATOR

Author's Certificate, USSR, class B 01 D 45/04 No 601030, filed 7 Jan 75 No 2094722, published 4 Apr 78

KALININA-IVANOVA, YE. V. and PESHIY, O. I.

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 10, 1978 Abstract No 10.34.46 P by G.N.M.]

[Text] The patent refers to an inertial separator for purification of air, primarily for gas turbine engines, including an exit cone placed at the housing inlet, along whose axis is placed a conical dust catcher and exhaust connection piece. To reduce the hydraulic drag of the separator and retain the dimensions of the device, and improve purification efficiency, the inlet edge of the dust catcher is placed on the outlet edge of the exit cone and the ratios of the exit cone aperture inlet diameter d_{in}, exit cone length l_{dif}, and catcher aperture inlet diameter d_{cat} to the housing diameter D lie within ranges of $d_{in}/D = 0.70-0.80$; $l_{dif}/D = 0.53-0.60$; $d_{cat}/D = 0.50-0.65$.

USSR UDC 621.165-226.2(088.825)

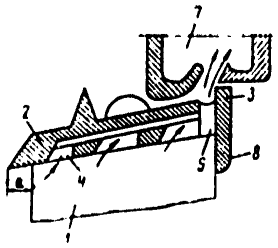
WORKING CASCADE FOR A SATURATED STEAM TURBINE

Author's Certificate, USSR, class F 01 D 5/28, No 615239, filed 25 Mar 76, No 2340918, published 5 Jun 78

FILIPPOV, G. A., POVAROV, O. A., ZIL'BER, T. M., UGOL'NIKOVA, L. A., KOSYAK, YU. F., YUSHKEVICH, YU. E., ARKAD'YEV, B. A., and GOL'MAN, V. I., Moscow Power Engineering Institute

[From REFERATIVNYY ZHURNAL, TURBOSTROYENIYE No 1, 1979 Abstract No 1.49.47 P]

[Text] A working cascade is proposed for a saturated steam turbine based on vanes 1 (see figure) to which the peripheral banding 2 is fastened with outer radial sealing rim 3 on the trailing edge. On the inner surface of the banding are moisture collecting grooves 4, at least one of which is located on the inlet portion of the banding in front of the leading edges of the vanes. Directly in front of rim 3 in the banding are clear exhaust apertures 5 connected to grooves 4 inside the banding by channels 6. The vapor trap chamber 7 is situated above the apertures 5.



USSR UDC 629.7.036.3-226-55(088.8)

A MECHANISM FOR TURNING THE GUIDE VANES OF A TURBOMACHINE

USSR Patent Class F 01 D 9/02, F 04 D 29/46 No 626228, filed 10 Jan 77 (No 244100), published 30 Aug 78

BOGACHUK, A. N. and RYBAKOV, V. V., Yaroslav Combine for Production of Motor Vehicle Diesel Engines

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 3, Mar 79 Abstract No 3.34.16 P]

[Text] A mechanism for turning the guide vanes of a turbomachine has been patented which includes a driver coupled to the vanes through intermediate links, each of the latter constituting a flexible element which embraces the pivot of a vane and is fastened to it, with the distinguishing feature that, for better regulation of the position of the vanes, this driver has the form of a rigid ring with cantilevers onto which the tip of the flexible member of each vane is fastened.

USSR UDC 629.7.064:536.24

A THERMOGRAVITATIONAL HEAT PIPE

USSR Patent Class F 28 D 15/00 No 629434, filed 17 May 77 (No 2483375), published 23 Sep 78

SKLADNEV, A. A., KARPOV, A. M., SHIRSHOV, A. N., KORNEYEV, A. D. and DOBROVOL'SKIY, L. N., All-Union Correspondence Institute of Mechanical Engineering and All-Union Scientific Research Institute of Bioengineering

[From REFERATIVNYY ZHURNAL, AVIATSIONNYYE I RAKETNYYE DVIGATELI No 3, Mar 79 Abstract No 3.34.158 P]

[Text] A thermogravitational heat pipe has been patented which consists of a hermetic case with a coaxial insert inside, the lower part of this insert separated from its upper part by a barrier and linked through ducts with the condensation zone between the case and the upper part, the upper part in turn linked to the space between the case and the lower part. The lower part has an open bottom end. For intensification of the heat transfer, the top end of the insert is capped and the bottom end is fastened to the bottom of the case, also the diameter of the lower part of the insert is smaller than the diameter of its upper part and the walls of the upper part are perforated throughout the height so as to allow the vapor to flow into the condensation zone. Figures 1.

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